

day 23

Tue 10/1

3.3/39-40, 49

3.4/1-8

Wed 10/2

3.4/9-10, 15-16, 19-21,  
29-30

Thu 10/3

3.4/33-34, 37-38, 43-45

3.5/1-8

Fri 10/4

3.4/51-52, 55, 61-63

3.5/9-10, 17-19, 29-30

Mon 10/7

3.4/72-75, 83, 85

3.5/41-42, 49-50, 56-57,  
62-63

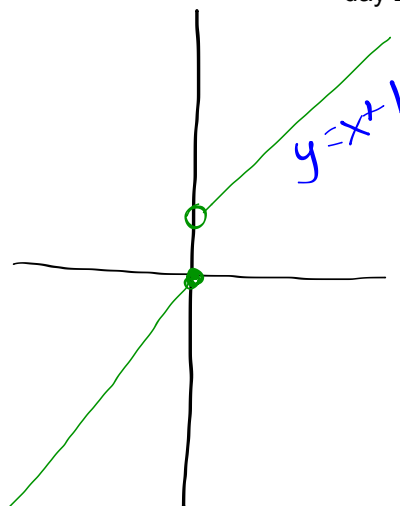
day 23

3.2/31 Graph  $f(x) = \begin{cases} x, & \text{for } x \leq 0 \\ x+1, & \text{for } x > 0 \end{cases}$

b) for  $x < 0$ , what is  $f'(x) = 1$

c) for  $x > 0$ , what is  $f'(x) = 1$

d) is  $f(x)$  differentiable at  $x=0$ ?  
explain



I)  $f(x)$  is NOT continuous  
at  $x=0$ , so it's  
NOT differentiable at  $x=0$

II definition

i)  $f(x)$  exists at  $x=0$ ? ✓

ii)  $\lim_{x \rightarrow 0^-} f(x) = 0$

$\lim_{x \rightarrow 0^+}$  blah blah blah  
but I don't care  
about continuity

→ alternative II  
definition (of derivative)

$$f'(0) = \lim_{x \rightarrow 0^+} \frac{f(x) - f(0)}{x}$$

$$= \lim_{x \rightarrow 0^+} \frac{(x+1) - 0}{x} = \lim_{x \rightarrow 0^+} 1 + \frac{1}{x}$$

DNE

day 23

$$f(x) = \begin{cases} x, & \text{for } x \leq 0 \\ x+1, & \text{for } x > 0 \end{cases}$$

$$g(x) = \begin{cases} x, & \text{for } x \leq 0 \\ \frac{x^2-1}{x-1}, & \text{for } x \text{ in } (0,1) \\ x+1, & \text{for } x \geq 1 \end{cases} = \frac{(x-1)(x+1)}{(x-1)}$$

the  
same

$$|x| = \begin{cases} x, & \text{if } x \geq 0 \\ -x, & \text{if } x < 0 \end{cases}$$

day 23

3.3/41) Let  $f(x) = 2x^3 - 3x^2 - 12x + 4$

a) horizontal tangent?

slope of tangent = 0

$$f'(x) = 6x^2 - 6x - 12 = 6(x^2 - x - 2)$$

$$= 6(x-2)(x+1)$$

$$0 = f'(x) = 6(x-2)(x+1)$$

$\Rightarrow$  horizontal tangents at  $x = -1, 2$

Pts:  $(-1, 11)$  and  $(2, -16)$

b) find all pts where slope ~~has~~ is 60.

$$f'(x) = 6(x-2)(x+1) = 6x^2 - 6x - 12$$

$$60 = f'(x) = 6x^2 - 6x - 12 \Rightarrow 6x^2 - 6x - 72 = 0$$

$$6(x^2 - x - 12) = 0$$

$$6(x-4)(x+3) = 0$$

$$x = 4, -3$$

Pts:  $(4, 36)$ ,  
 $(-3, -41)$

8.3/35

$$y = -3x^2 + 2 ; a = 1$$

2<sup>ND</sup> Draw  $\Rightarrow$  Tangent  
 $x = 1$  day 23

a) find eqn of tan line

$$(\text{Pt}) = (1, f(1))$$

$$y' = -6x$$

$$y'(1) = y'|_{x=1} = -6(1) = -6$$

$$= (1, -1)$$

$$y+1 = -6x+6$$

U

$$y - (-1) = -6(x - 1)$$

$$y = -6x + 5$$

derivative notation

day 23

$f'(x)$  - used most frequently when I have a rule for  $f(x)$

- but I can use it anytime I know the name of the function
- the 'x' is just a placeholder

$\frac{dy}{dx}$  - ONLY used when I have a rule for y  
 (even it's cheap like  $y=f(x)$ )

- MUST BE a function of x!

- e.g. if  $y = g(w)$  then  $\frac{dy}{dw} = \dots$

$\frac{d}{dx}$  - only used when the function (of x) follows in parentheses

- e.g.  $\frac{d}{dx}(2x^2 - 7) = 4x$

Learn the power rule well

How about if I multiply  
2 functions together?

... idk. if I can multiply them  
out, then fine. Otherwise.....

..... PRODUCT RULE

$$\frac{d}{dx}(f \cdot g) = f'(x)g(x) + f(x)g'(x)$$

$$(fg)' = f'g + fg'$$

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p. 380

white book

table of  
everything  
you will need  
to know  
(not really)